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The Wheat Jointworm in Oregon

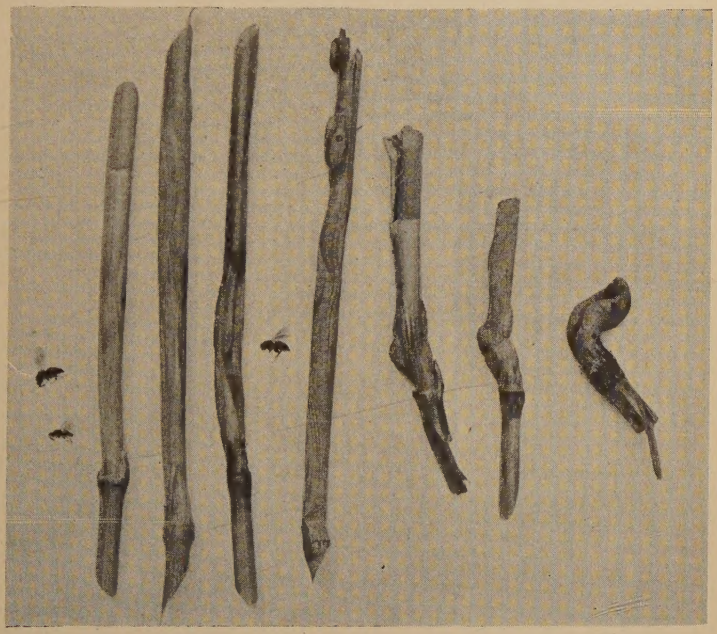

Fig. 1. Jointworm galls, issuance holes, and parents of the jointworm.

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The Wheat Jointworm* in Oregon

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The wheat jointworm has been a serious pest of wheat in the wheat growing states of the East for eighty years or more. It was not known to occur in Oregon until July, 1926, when it was found infesting wheat stubble near Molalla in Clackamas county. At present the insect is not widely distributed in Oregon but is doing much damage where it is abundant. If it is to be held in check and losses to the wheat crop are to be reduced, farmers should become familiar with the character of its attack on wheat and the best known methods of controlling it.

Infestation confined to two small areas. Thorough surveys throughout the Willamette Valley and examinations of wheat from other parts of the state indicate that the jointworm infestation is limited to two relatively small areas, both of which are in the Willamette Valley. One of these areas is near Molalla, where the insect was found in 1926, and the other is near Lebanon, in Linn county.

The Molalla infestation is the larger of the two and is about twenty-five miles across the greatest diameter. The center of the colony is located about four miles west of Molalla and from this point extends southeastward to a point seven miles southeast of Molalla on the Molalla River, southward to Marquam, southwestward to Mt. Angel, westward to St. Louis, northward to the Willamette River north of Canby and northeastward to fields about one and one-half miles north of Mulino.

The Lebanon colony is almost fifteen miles across and extends from Lebanon northwestward five or six miles, westward ten miles to Tangent, and southwestward about fifteen miles to fields three miles west of Shedd.

Infestation is heavy toward the center of both of these colonies and light toward their borders. Several infestations of more than 90 percent have been found in the Molalla district and a 79 percent infestation in the Lebanon district. In some samples taken near Molalla there have been an average of one and a fraction infested joints per stem. Wheat growers in these infested districts should strive to control these pests to avoid present and future losses to the wheat crop.

Presence indicated by galls in the stems. The wheat jointworm is the grub-like offspring of a small glossy black insect which resembles superficially a small flying ant. This grub feeds in cells or galls in the walls of the wheat stems from some time in May until the ripening of the grain.

**Harmolita (Isosoma) tritici* (Fitch). Order, Hymenoptera; family, Eurytomidae.

The presence of the insect in the fields is most readily detected after harvest. By this time, the galls made by the jointworm, most of which are left with the stubble, have become hard and woody, so that, if a stem containing them is passed lengthwise between the thumb and forefinger and pressed firmly, the hard parts of the stem which resist the pressure can be located. If the piece of stubble is then stripped to the bare stem, gall-like protuberances are usually seen. In some cases, however, the galls are not apparent and only a slight twisting of the fibers of the stem is observed. In any case, that portion of the stem which contains the jointworms is very hard, and if the stem be broken in two or split lengthwise with a knife through the hard portion, yellow legless grubs about 3/16 inch long and 1/5 as broad will be seen, one in each gall or cell. These are the jointworms which have hatched and completed their growth within the wall of the wheat stem, feeding during the whole period on the sap of the plant. If the stubble is long and the infestation heavy, a single stem may contain as many as three infested joints; more frequently, however, only one joint in a single stem is infested. Twenty-six jointworms have been found in a single infested joint. In wheat collected in Oregon, the average number per infested joint is approximately eleven.

The jointworm is frequently noticed at threshing time. Although, as previously stated, most of the grubs remain with the stubble, those located in the higher joints are taken to the thresher, where the breaking of the stems may expose them to view.

Before harvest, if the infestation is heavy, there may be some falling of the stems caused by jointworms weakening the stems at the points of concentration. Falling of stems does not, however, prove that the jointworm is present because this condition is sometimes brought about by other insects as well.

Seasonal history in Oregon. The adults begin issuing late in April or early in May from unplowed infested stubble in which they have passed the winter in an immature state. Very few are killed by the winter weather. Issuance from the stubble continues through May and if May is cool and rainy, through the first half of June. In May, in fields of infested stubble, these glossy black insects may be seen walking up and down the stubble, grass, and volunteer wheat and flying for short distances from plant to plant.

The females contain eggs at the time of emergence and most of these eggs appear to be fully developed. The greatest number found in a single female in Oregon material was 124 and the smallest number 45. In most cases, the number is from 60 to 110 each. They begin laying eggs soon after issuance, forcing the eggs into the walls of any jointed stems which they may find. Galls are soon formed in the walls of the stems, sometimes before the hatching of the eggs. The time required for the hatching of the eggs in Oregon has not been determined. In the Eastern States it is said to be fourteen days, more or less depending on weather conditions. Minute, whitish, translucent grubs or worms, which are the first stage jointworms, issue from these eggs. The grubs remaining in the cells in which they have hatched feed on the sap of the plant and, with several molts, increase in size until just before harvest, when the grain ripens and the plant dries up. The jointworms are then full

grown and have changed in color from translucent white to yellow. They do no further feeding but remain in a grub-like form in the straws until early October when they begin to shed their skins and assume a form resembling the future adult. This stage is called the pupa. By the end of October most of the jointworms have changed to pupae. These pupae are light yellow and, except for a partial loss of glossiness and sometimes a slight browning, remain so until the following spring. About the middle of April, the pupae begin to darken and by the end of the month most of them are black and some have again cast their skins and emerged from the straws and the stubble as the ant-like parents of the next generation of jointworms.

Jointworms reduce the size and quality of the crop. Injury to wheat by the jointworm is caused by the consumption of sap and the deformation of the stems. On issuance in the spring, the adults place their eggs in fairly well developed plants with jointed stems. When the eggs hatch (about two weeks later) the young grubs begin feeding in the walls of the stems. From the time of hatching until just before harvest, these grubs consume in increasing amounts the sap, which, in uninfested plants, would be entirely used to nourish the plant and the grain. Reduction in the size and the quality of the crop must result. Besides the actual loss of sap consumed by the jointworms, it is probable that the normal flow of sap to the heads is interfered with by the formation of galls in the stems and frequently, in heavy infestations, the weakening of the stems caused by the galls results in lodging.

Although the fact that jointworms when abundant do much damage is indisputable, it is difficult to measure this damage accurately. Losses depend chiefly on the degree of infestation and the vigor of the affected wheat. A few jointworms do little damage. Many jointworms do much injury, but vigorously growing wheat is much better able to withstand their constant feeding than poor wheat. Tests were made by Dr. W. J. Phillips* in the East in which the wheat taken from a definite number of heads from infested stems was compared with the wheat taken from the same number of heads from uninfested stems and each head from an infested stem was matched with a head of equal length from an uninfested stem. These tests showed that the quantity of wheat may be reduced approximately 12 percent to 30 percent, according to the number of joints infested per stem. It was also shown that the wheat from the infested stems was inferior to that from the uninfested stems. These comparisons do not take into consideration the possible effect on the length of the head of the feeding of the jointworms, or the losses resulting from fallen straws which can not be threshed. In the Eastern States these losses may be very heavy. Thus far, falling of stems owing to jointworm injury has not been extensive in Oregon.

Fall plowing destroys the jointworms. The wheat jointworm attacks no other crop than wheat; consequently after harvest most of the worms which will produce the next year's generation are in the wheat stubble. These can be destroyed if the stubble containing them is buried

*The Wheat Jointworm and Its Control. U. S. Dept. of Agr. Farmers' Bul. 1006. 1918. Studies of the Life History and Habits of the Jointworm Flies of the Genus Harmolita (Isosoma), with Recommendations for Control. U. S. Dept. of Agr. Bul 808. 1920.

in the soil and left undisturbed during the winter. This can be accomplished by deep fall plowing. In Oregon, wheat planted adjoining heavily infested stubble which was buried by fall plowing developed but slight infestation. There was no evidence of any adults issuing from well buried stubble. In actual practice it is, of course, impossible to bury every bit of stubble by plowing, but where care is used surprisingly little is left uncovered. In cutting the wheat, the stubble should be left as high as possible, to reduce the number of jointworms taken to the thresher. To make the destruction more complete, straw stacks should

Fig. 2. Wheat stubble properly plowed under.

be burned, where burning can safely be done, and any straw remaining should be plowed under. If all the fields could be properly plowed under in the fall and reasonable care was taken to destroy the straw left by the threshers, it is improbable that the jointworms would ever be numerous enough to cause much injury.

It is customary among many farmers to plant clover in winter wheat in February, and the stubble from this wheat can not be plowed under without destroying the clover. This situation could be avoided if the clover were planted with some other grain than wheat, or if the clover were planted alone. Winter barley is considered by the department of Farm Crops, Oregon State Agricultural College, to be a valuable crop in Oregon and a better nurse crop for clover than wheat. Winter gray oats is also considered a good nurse crop for clover. Many farmers believe that it is good practice to plant clover alone, because better stands are usually obtained in that way. With careful planning, most farmers could substitute one of the suggested crops for wheat, when it is necessary to plant clover, and realize a profit; or if, for any reason, that is not done,

the clover could be profitably grown alone. Certainly the adoption of some such crop rotation is advisable throughout the areas now infested with the jointworm.

In case it should prove impossible to plow the stubble in the fall, it should be plowed in the winter or early spring. While we are unable to state at the present time that winter plowing destroys the immature stages as effectively as fall plowing, we know that few or no adults reach the surface of the ground from winter-buried stubble.

In some parts of Oregon, farmers burn over the stubble fields to avoid the difficulty of burying the long and heavy stubble. Doubtless this burning destroys the jointworms, but great precautions must be taken to avoid setting fire to woodlands and other property; in fact, in many fields in the areas now infested, it would be inadvisable to attempt burning the stubble.

In case the stubble can not be plowed under or otherwise disposed of, the best recommendation that can be given is to plant all wheat as far away as possible from infested wheat stubble. Adult jointworms can fly, and probably for some distance, but many die without leaving the stubble fields, and others that leave do not reach growing wheat. A field planted some distance away thus has a better chance than one planted adjoining a field of infested stubble.

No way is known of destroying the jointworms while they are feeding in the growing wheat without also destroying the crop.

The success of the recommended methods of control depends to a great extent on cooperation among farmers. Plowing of infested stubble in the fall and winter by a few farmers can have but little effect on the whole jointworm population of the district and their fields are not safe from attack unless wheat stubble upon neighboring farms has also been destroyed.